

F.Y.B.Sc.(I.T.) – Semester I (October 2023)
FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS

(Time: 2½ hours)

Total Marks: 75

- N. B.: (1) All questions are compulsory.
(2) Make suitable assumptions wherever necessary and state the assumptions made.
(3) Answers to the same question must be written together.
(4) Numbers to the right indicate marks.
(5) Draw neat labeled diagrams wherever necessary.
(6) Use of Non-programmable calculators is allowed.

1. Attempt any three of the following: 15
a. Explain three-tier architecture with diagram.
b. What are the disadvantages of file processing system?
c. List out the Codd's Relational Database rules and explain any five rules.
d. Explain Entity relationship data model with example.
e. Illustrate different set operations in Relational algebra with example.
f. Explain selection and projection operator with example.
2. Attempt any three of the following: 15
a. Describe strong entity and weak entity with example.
b. What is an Attribute? Explain different types of Attributes.
c. What is a relationship? Explain types of relationships.
d. Explain domain integrity and key constraint.
e. Explain specialization with example.
f. Draw the E-R diagram for university database consisting of four entities i. Student ii. Department iii. Class iv. Faculty. Make the necessary assumptions.
3. Attempt any three of the following: 15
a. Explain 3NF with suitable example.
b. Explain decomposition and its types.
c. Explain the problem caused by data redundancy in DBMS.
d. Explain any two types of functional dependencies with example.
e. What are anomalies? explain insert and delete anomalies with example.
f. Explain BCNF with example.
4. Attempt any three of the following: 15
a. Explain classification of SQL commands.
b. Explain the Logical operators used in SQL with syntax and example.
c. Explain order by clause and group by clause with syntax and example.
d. Write a short note on index. Describe how to create and drop an index.
e. Explain about clustered file organization.
f. Write appropriate query for the table Doctor (Did, Dname, Qualification, Address, salary)
i. Add gender column to the above table.
ii. Retrieve Dname, Qualification and salary from the above table.
iii. Delete the record of doctor Arjun Mehta from Doctor table.
iv. Change the value of the field salary to 65000 for the Doctor Rina Sharma.
v. Delete the above table permanently from the database.
5. Attempt any three of the following: 15
a. Define a Transaction? List the properties of transaction.
b. Explain about precedence graph with example.
c. Write a note on parallel schedule. Give appropriate example.
d. Explain about Time Stamp ordering protocol.
e. Explain cascading rollback and strict two-phase locking protocol with example.
f. Write a note on log-based recovery.

F.Y.B.Sc.(I.T.) – Semester I (October 2023)
DIGITAL LOGIC AND APPLICATIONS

(Time: 2½ hours)

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1. Attempt any three of the following:

15

- a. What is a radix or base of a number system? Discuss various number systems.
b. i) Perform the following using binary subtraction: $(42)_{10} - (28)_{10}$
ii) Perform the following binary multiplication: $(1001)_2 \times (101)_2$
c. Convert the following
i) $(1051.36)_{10} = (?)_8$
ii) $(F9A.D5)_{16} = (?)_{10}$
iii) $(1011011.11010)_2 = (?)_{16}$
d. What is EX-OR operation? Construct EX-OR using Basic gates.
e. Why NAND and NOR gates are called as Universal gates? Construct basic gates from NOR gate.
f. Draw the truth table and logic circuit for the following expression:
 $Y = (\bar{A}B + \bar{B}C + B\bar{C})$

2. Attempt any three of the following:

15

- a. Simplify the following expression using K-map and draw the circuit diagram for the simplified equation. $Y = F(A, B, C, D) = \sum m(0, 2, 5, 8, 10, 13)$
b. i) Convert the given equation into canonical SOP form: $Y = AB + A\bar{C} + BC$
ii) Convert the given equation in to canonical POS form: $Y = (A+B).(A+C).(B+\bar{C})$
c. Prove and explain that output of a **NOR** gate is equal to output of **Bubbled AND** gate.
d. Minimize the following expression using K-map:
i) $Y = f(A, B, C, D) = \sum m(1, 3, 4, 5, 7, 9, 11, 13, 15)$
ii) $Y = f(A, B, C, D) = \pi M(0, 1, 2, 3, 7, 8, 9, 10, 11)$
e. What are Sum of Product (SOP) and Product of Sum (POS) logical equations? Also, explain concept of minterm and maxterm.
f. Prove the following using Boolean Algebra:
i) $[AB + C.(AB + AC)] = AB$
ii) $W\bar{X}.(W+Y) + WY.(W + \bar{X}) = W\bar{X}$

3. Attempt any three of the following:

15

- a. What do you mean by a full subtractor? Design full subtractor circuit using truth table and k-map.
b. Explain the operation of 4:1 multiplexer with the circuit diagram and truth table.
c. State similarities and differences between multiplexer and demultiplexer.
d. Explain in detail working of a half adder circuit.
e. What is a decoder? Explain 3:8 decoder circuit.
f. Draw neat and labelled circuit diagrams for the following:
i) 2:1 multiplexer
ii) 1:4 Demultiplexer

F.Y.B.Sc.(I.T.) – Semester I (October 2023)
DIGITAL LOGIC AND APPLICATIONS

4. Attempt *any three* of the following:

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- a. Explain in detail working of 2-bit Asynchronous counter.
- b. With neat and labelled diagram explain working of SR flip-flop.
- c. What is a Buffer Register? Explain in detail.
- d. What is a shift register? Discuss different modes of operation of shift register.
- e. Explain the following terms:
 - i) Flip Flop
 - ii) Register
 - iii) Synchronous and Asynchronous Counter
- f. Explain in detail working of a D flip-flop.

5. Attempt *any three* of the following:

15

- a. What are codes? Explain the necessity of codes.
- b. Design and explain a 4-bit adder.
 - i) Obtain the XS-3 code for $(428)_{10}$
 - ii) Convert $(0101\ 0011)_{BCD}$ into binary
- d. Write a short note on gray code.
- e. What is BCD code? What are the advantages and disadvantages of BCD code.
- f. A 4-bit binary number is represented as $A_3\ A_2\ A_1\ A_0$ where represents individual bits with A_0 equals to LSB. Design a logic circuit that will produce a HIGH output whenever binary number is greater than $(0\ 0\ 1\ 0)_2$ and less than $(1\ 0\ 0\ 0)_2$

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DIGITAL LOGIC AND APPLICATIONS

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F.Y.B.Sc.(I.T.) – Semester I (October 2023)
TECHNICAL COMMUNICATION SKILLS

(Time: 2½ hours)

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15

1. **Attempt any three of the following:**
a. Write short note on any two seven C's.
b. Explain the process of communication.
c. What do you mean by Kinesics?
d. Prepare a brochure for a new hotel opened at Goa.
e. Write a short note on Notice.
f. Mention the disadvantages of Video Conferencing.

15

2. **Attempt any three of the following:**
a. Explain 5 rules of email etiquettes.
b. Mention the classification of reports and explain the same.
c. Explain Individual reports in short..
d. How to overcome stage fright?
e. Mention various parts of Resume.
f. How can you close an interview process?

15

3. **Attempt any three of the following:**
a. What are the worst Listening habits?
b. Explain some of the barriers that cause poor listening.
c. Short Note on Teleconferencing/Web Conferencing Interviews.
d. Explain in brief any three types of conferences.
e. Which important points one needs to remember while choosing a venue for conference?
f. What are the guidelines for conducting successful Team Briefing?

15

4. **Attempt any three of the following:**
a. How graphics play important role in business communication?
b. Short note of email ethics.
c. Explain different types of conflict managers.
d. Briefly explain Patents.
e. How visual aids are used in business communication?
f. What taboos you must avoid while presentations?

15

5. **Attempt any three of the following:**
a. **Change the following into indirect speech:---**
i. Ria said, "Reena is sleeping"
ii. Tom said, "Today is my birthday."
iii. Sêema said, " This is my book."
iv. Lina said, " Next year, I will visit London."
v. "We are going for a movie tomorrow" , said mom.

F.Y.B.Sc.(I.T.) – Semester I (October 2023)
TECHNICAL COMMUNICATION SKILLS

b. Fill in the blanks with suitable determiners. More than one answer is possible in certain cases.

- i. workers are on strike.
- ii. There are colours in the rainbow.
- iii. The subject of speech was very interesting.
- iv. candidate deserves to win the elections.
- v. member of the group was wearing a black badge.
- vi. I could not finish my work as I had time on my hands.
- vii. We have a get-together at our place Sunday.
- viii. child needs love and care.
- ix. Has one of you been to Shirdi?
- x. books that he had, he sold them also.

- c. What are the steps for chunking information?
- d. Write short note on Corporate Social Responsibility(CSR).
- e. According to you which of the three brain storming do you prefer and why?
- f. What is the importance of colour in power point presentations?

F.Y.B.Sc.(I.T.) – Semester I (October 2023)
COMPUTATIONAL LOGIC AND DISCRETE STRUCTURES

(Time: 2½ hours)

Total Marks: 75

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(6) Use of Non-programmable calculators is allowed.

1. Attempt any three of the following:

15

- a. Let $X = \{1, 2, 3, 4, 5, 6, 7\}$ be universal set & $P = \{2, 4, 5\}$, $Q = \{1, 3, 5\}$, $R = \{2, 3, 7\}$ be subsets of X . Prove or disprove
i) $(P \cup Q)' = P' \cap Q'$
ii) $(P \cap R)' = P' \cup R'$
iii) $Q - R = Q \cap R'$
- b. Among the integers 1 to 120, determine the number of integers which are divisible neither by 2 nor by 3 nor by 7
- c. In a survey of 60 people, it is observed that, 25 read Times of India, 26 read Indian Express & 26 read Economics times. 9 read Times of India & Economics Times, 11 read Times of India & Indian Express, 8 read Indian Express & Economics Times. 3 read all three newspapers. Determine the number of people who read
i) Only Times of India
ii) Times of India, Economics Times but not Indian Express
- d. State Principle of Mathematical Induction.
Apply it to prove that $7^n - 1$ is divisible by 6 for every $n \geq 1$.
- e. Let $A = \{2, 3, 5, 8\}$ be the given set. Let R be the relation defined on set A such that aRb if $a + b > 8$
i) Find elements of R
ii) Find matrix form of R
iii) Draw diagram of R
iv) Determine whether R is reflexive, symmetric & transitive. Justify your answer.
- f. Let $A = \{1, 4, 5\}$ be the given set. $R = \{(1, 1), (1, 5), (4, 5), (5, 1)\}$ & $S = \{(1, 1), (4, 1), (5, 1), (5, 4)\}$ be relations defined on set A . Then determine union between R & S , Complement of R , Inverse of S & SoR with the help of matrices.

2. Attempt any three of the following:

15

- a. Given $P(A) = 0.5$, $P(B) = 0.8$. If A & B are independent events then find
i) $P(A \cap B)$
ii) $P(A \cup B)$
iii) $P(A \cap B^c)$
iv) $P(A^c \cap B^c)$
v) $P(A^c \cap B)$
- b. Determine whether $f: R - \{1/3\} \rightarrow R$ defined by $f(x) = \frac{4x+5}{3x-1}$ is injective, surjective & bijective function. If it is bijective find its inverse.
- c. A box contains numbered cards from 1 to 15. One card is selected randomly from a box. What is the probability that number on the card is
i) Prime
ii) Divisible by 5
iii) Either prime or divisible by 5

d. Let (X, p_i) represent the probability distribution as follows. Find

i) $P(-2 < X < 1)$

ii) $P(X < 0 / X \geq -1)$

iii) Mean & variance of the distribution

X	-2	-1	0	1	2	3
p_i	0.2	0.1	0.1	0.2	0.1	0.3

e. 2 cards are drawn randomly from well-shuffled playing cards. Find the probability that

i) Both are spade

ii) Both are king

iii) One is red & other is black

f. f, g & h are well defined functions on set of real numbers by $f(x) = 4x + 5$, $g(x) = 3x - 2$ & $h(x) = x - 8$, then find the value of constant k so that $hof(3) = goh(k)$

3. Attempt any three of the following:

15

a. Solve the recurrence relation:

$$a_n - 5a_{n-1} + 6a_{n-2} = 0, n \geq 2, a_1 = -3, a_2 = 1$$

b. Solve the recurrence relation:

$$c_n + 14c_{n-1} + 49c_{n-2} = 0, n \geq 2, c_0 = 1, c_2 = 4$$

c. $t_k - 2t_{k-1} + 3t_{k-2} = 0, k \geq 2, t_0 = 2, t_1 = 3$ is given recurrence relation then find first 5 terms of the sequence

d. A box contains 4 red & 8 blue marbles. 2 marbles are selected randomly. In how many ways marbles are selected if

i) Both marbles are red

ii) Both marbles are blue

iii) Both marbles are of same colour

iv) Both marbles are of different colour

e. Find positive integer n if $2(nP_2) + 50 = (2n)P_2$

f. Among the integers 1,2,3,4,5,6 four digit number is formed without repetition. In how many ways these numbers can be formed if

i) There is no restriction

ii) Number is greater than 2000

iii) Number is even

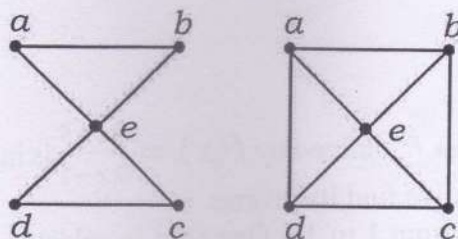
iv) Number is divisible by 5

4. Attempt any three of the following:

15

a. Explain the terms Cut vertex & Bridge with suitable example.

b. Determine whether following graphs are Euler & Hamiltonian. Justify your answer



c. Definê: Undirected Graph & Directed graph

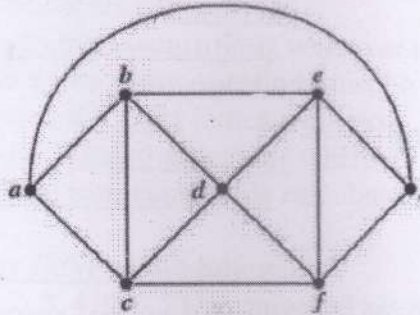
Draw the graph corresponding to adjacent matrix given below

i) $A = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$ ii) $A = \begin{bmatrix} 0 & 1 & 2 \\ 0 & 1 & 1 \\ 0 & 1 & 0 \end{bmatrix}$

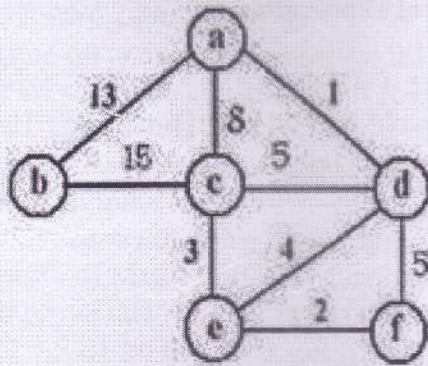
d. Explain with suitable example of each: Regular Graph, Complete Graph & Planar Graph

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COMPUTATIONAL LOGIC AND DISCRETE STRUCTURES

- e. Write the steps of Powell's Algorithm to find chromatic number of given graph.
 Apply Powell's Algorithm to find chromatic number of following graph



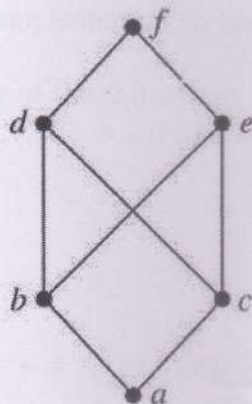
- f. Write the steps of Prim's algorithm to find minimal spanning tree of the given weighted graph.
 Apply Prim's Algorithm starting with vertex e to find minimal spanning tree of the given weighted graph.



5. Attempt *any three* of the following:

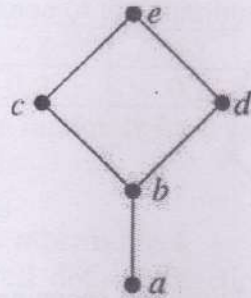
15

- a. Define: Upper bound, Lower bounds, Greatest Lower bound & Least Upper bound of given POSET
 Find upper bounds, least upper bound, lower bounds & Greatest Lower bound of subset $B = \{ b, c, e \}$ from the following POSET



- b. Prove that D_{20} is bounded lattice but not complemented lattice.

- c. Prepare the table of GLB & LUB of each pair of the following POSET. Determine whether it is a lattice. If it is a lattice determine whether it is bounded lattice.



- d. A binary tree has 13 nodes. Draw the tree if the post order & in order traversals of tree are as follows

In order	D	B	P	H	Q	S	E	A	C	R	K	F	L
Post order	D	P	S	Q	H	E	B	R	K	L	F	C	A

- e. Represent the following mathematical expressions as binary tree
 i) $E = 4a + [(3a - 2c) \div (a + 4b)]$
 ii) $E = (2a - 3c)^3 \div [(b - c) + (3c + 4d)]$
- f. Explain the terms with example of each: Rooted tree, Binary tree, Level of vertex in rooted tree, Weighted tree, Weighted path length

F.Y.B.Sc.(I.T.) – Semester I (October 2023)
PROGRAMMING PRINCIPLES WITH C

(Time: 2½ hours)

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1. **Attempt any three of the following:** 15
- a. Explain the basic structure of a C program with an example.
 - b. Draw the flowchart and write a C program to compute simple interest.
 - c. Classify the following as valid/invalid Identifiers.
i) num2 ii) \$num1 iii) +add iv) a_2 v) 199_space
 - d. Define Algorithm. Write an algorithm to find the area of a square.
 - e. Explain briefly how to use # define directive.
 - f. Define pseudocode. Write a pseudocode to find the sum and average of given three numbers.
2. **Attempt any three of the following:** 15
- a. Explain any five operators used in C language.
 - b. Explain 'if' condition with general syntax and suitable example.
 - c. Explain 'Nested if...else' condition with general syntax and suitable example.
 - d. Write a C program to find the largest of three numbers using ternary operator.
 - e. Explain switch statement with syntax and example
 - f. What is an Infinite loop. Give an example.
3. **Attempt any three of the following:** 15
- a. What is function? Explain the difference between user defined and library functions.
 - b. Explain getchar () and putchar () functions with suitable example.
 - c. Write a c program using function to check whether the given number is odd or even.
 - d. Define a recursion. Write a C recursive function for finding a sum of n natural numbers.
 - e. What is a Global declaration? Give an example.
 - f. What is Error Handling? Explain with suitable example.
4. **Attempt any three of the following:** 15
- a. Define Pointers. Give suitable example.
 - b. What is Pointer to Pointer? Give suitable example.
 - c. What is an Array? Explain the declaration and initialization of one-dimensional and two-dimensional array with an example.
 - d. Write a C program to find the largest element in an array.
 - e. Define a string. Explain any four string library functions with syntax and example.
 - f. Explain malloc () and calloc () function with syntax.
5. **Attempt any three of the following:** 15
- a. What is structure? Explain the C syntax of structure declaration with example.
 - b. Write a C program to pass structure variable as function argument.
 - c. Define union. Explain the general syntax of union with example.
 - d. Write a C program to create structure with five student's details and display the same.
 - e. What is File Management? Write a program to open and close a file.
 - f. Write a program to copy the contents from one file to another.